

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 3959

Konkoly Observatory
Budapest
7 December 1993
HU ISSN 0324 - 0676

FG SAGITTAE HAS BEEN A CARBON STAR SINCE 1981

Numerous works have been made on the post-AGB peculiar variable star FG Sge. Its spectral type changed from B4 I in 1955 to A5 Ia in 1967 then F6-7I in 1980 (e.g. Langer et al. 1974; Montesinos et al. 1990, and references therein). The luminosity in the optical region started to decline suddenly in August 1992 (e.g. Papousek 1992; Guinan et al. 1992; Jurcsik 1992). The spectral variation of this object has been monitored at Asiago Observatory since 1979 using the prismatic spectrograph Camera VI with RCA S-20 image tube mounted on the 120 cm reflector. The spectral range is from 380 to 770 nm, and the resolution is about 0.4 nm at H γ . The spectra were digitized using the PDS microdensitometer of the Astronomical Observatory of Padua. Log-intensity tracings of some selected spectra are shown in Fig. 1, where the ordinate is an arbitrary scale.

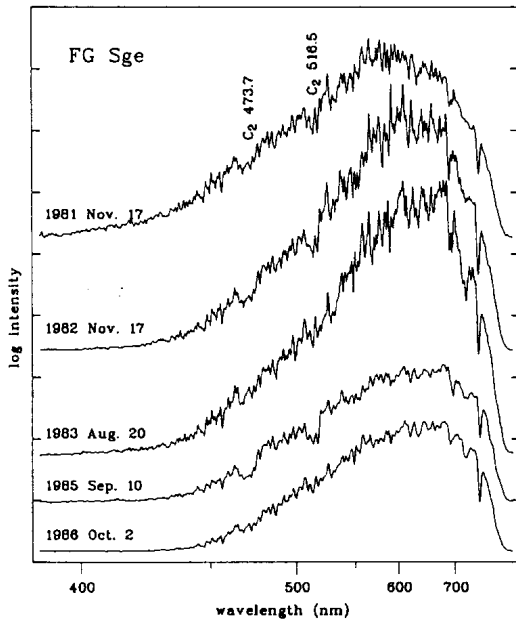


Figure 1. Log-intensity tracings of spectra of FG Sge taken on (from top to bottom) 1981 Nov. 17, 1982 Nov. 17, 1983 Aug. 20, 1985 Sept. 10, and 1986 Oct. 2

The first clear profiles of the C₂-Swan bands at 473.7 and 516.5 nm were detected on the spectra taken in November 1981 (Fig. 1). These bands were prominent in 1982 and 1985, while were weak in 1983 and 1986 (Fig. 1). They were again prominent in 1988 and in 1992 before the beginning of the light decline (Iijima et al. in preparation). It may be obvious that FG Sge has been a carbon star, but with a very unstable atmosphere, in the last decade.

The sudden light decline of this object in 1992 may have been due to, as suggested by several astronomers (e.g. Guinan et al. 1992; Iben & Livio 1993; Stone et al. 1993; Woodward et al. 1993), a condensation of carbon dust which is not a rare phenomenon in the atmosphere of hydrogen deficient carbon stars (Warner 1967). This scenario is consistent with the increasing of the infrared flux and the lack of the emission feature of silicate dust observed by Woodward et al. (1993). Since FG Sge ejected the planetary nebula He 1-5 about 6000 years ago (e.g. Flannery & Herbig 1973), its atmosphere could be hydrogen deficient. However, the absorption features of C¹²C¹³ 474.4 and C¹³C¹³ 475.2 nm, which are usually not detectable in spectra of hydrogen deficient carbon stars (Bidelman 1953; Warner 1967), are seen on our spectra. Even if it is difficult to see them on the tracings (Fig. 1), they are visible on the original plates. This phenomenon may be related to the overabundance of *s*-process elements of this object (Langer et al. 1974).

T. IIJIMA

Astronomical Observatory of Padua,
Asiago section,
Osservatorio Astrofisico,
I-36012 Asiago (VI) Italy

F. STRAFELLA

Department of Physics,
University of Lecce, Via Arnesano,
I-73100 Lecce, Italy

References:

- Bidelman, W.P., 1953, *ApJ*, **117**, 25
 Flannery, B.P., Herbig, G.H., 1973, *ApJ*, **183**, 491
 Guinan, E.F., McCook, G.P., Thrash, T.A., 1992, IAU Circ. 5632
 Iben, I. Jr., Livio, M., 1993, *ApJ*, **406**, L15
 Jurcsik, J., 1992, IBVS, No. 3775
 Langer, G.E., Kraft, R.P., Anderson, K.S., 1974, *ApJ*, **189**, 509
 Montesinos, B., Cassatella, A., González-Riestra, R., et al., 1990, *ApJ*, **363**, 245
 Papousek, J., 1992, IAU Circ. 5604
 Stone, R.P.S., Kraft, R.P., Prosser, C.F., 1993, *PASP*, **105**, 755
 Warner, B., 1967, *MNRAS*, **137**, 119
 Woodward, C.E., Lawrence, G.F., Gehrz, R.D., et al., 1993, *ApJ*, **408**, L37